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# AN EXPERIMENTAL EVALUATION OF METHOD IN SPELLING

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Educational writings of the past decade have contained numerous reports of surveys of the teaching of the school subjects, and many studies of the psychology of the common branches. If these studies are to influence future attainment, it must be through the adoption of methods based on the psychology of the subject in question. Given certain actual conditions revealed by measurement, the derivation of method is a question of the psychological fitness of a means to an end. The laboratory for such research is the schoolroom. The following pages report the experimental evaluation of a method of teaching spelling to fourth-grade pupils.

The report deals with the following phases of the problem in order: (1) a preliminary survey of the spelling results obtained in the class, a comparison of these results with available measurements, and an analysis of the function into component psychological factors to isolate the numerous purposes which a good method must fulfil; (2) conclusions upon which methods were built up synthetically; (3) description of methods; (4) comparison of results obtained by new method with the scores recorded in the preliminary survey and with available standards; (5) general conclusions.

## PRELIMINARY SURVEY

The class average for two weeks on daily list lessons from the *Hicks Champion Speller* was 91 per cent. Words were studied at home and at school. This average was quite satisfactory, but when the same words were given in a review test after one week the class average fell to 78 per cent. New or

unstudied lessons from the Hicks speller gave class averages ranging from 70 to 80 per cent. The net result of spelling study was therefore almost negligible with the method used. No permanent spelling vocabulary was acquired from such study. Next the words for one month were reviewed carefully on two consecutive days. The words were given in a test with a resulting average of 80 per cent. Review tests of this nature were, then, not conducive to permanence. Home study was eliminated to control the time factor and to study method. The class averages for five days were 84, 86, 85, 86, and 86 per cent. The lessons were taught according to the suggestions in the Hicks speller. Papers were marked, returned, and corrected. After a week the five lessons were given as a review without any opportunity for restudy. The average on this review was 78 per cent. The insignificant permanent returns warranted the assumption that the spelling needs of the class could not be met by the further use of the *Hicks Champion Speller*.

A story composed entirely of words contained in the Jones II and III Grade vocabulary was dictated without study. The class average percentage of words correctly spelled was 77. Papers were returned, and individual lists were made for school study. Pupils were asked to hand in their lists as soon as they were sure they had learned all the words they had missed. With no further announcement the same story was dictated after one week. The class average percentage of words correctly spelled was 92.5. From this date on, words for daily lessons were selected from Jones II, III, and IV Grade vocabulary. Words were grouped in phrases instead of appearing in lists. Home study was not permitted. Pupils handed in lists when they were sure they had mastered them. Similar word-groupings were incorporated in dictation lessons during the following week. Lists were returned for study of words missed in dictation. The class average of words spelled

correctly in the four dictations given in one month was 90 per cent. Daily lessons were being used as a preparation for later lessons in dictation. The deferred use of words was brought to the attention of the pupil. The net result of this type of study was greater than that of the conventional method.

For purposes of later comparison, several other spelling measurements were undertaken during the month. A set of original compositions was marked for spelling, and 78 per cent of the words were found to be correctly spelled. The Ayres spelling tests were given without preparation. The class average on Test M was 75 per cent and on Test N 55 per cent. Five words from each column beginning with Test F and continuing through Test R were given. The percentage of words correct was 73. Compared with Ayres's standards, these averages were very low.

The most interesting phases of the data obtained in the preliminary survey were the records of certain individuals. The pupils were ranked according to their standings in a dictation lesson of 120 words from the Jones II, III, and IV Grade lists.

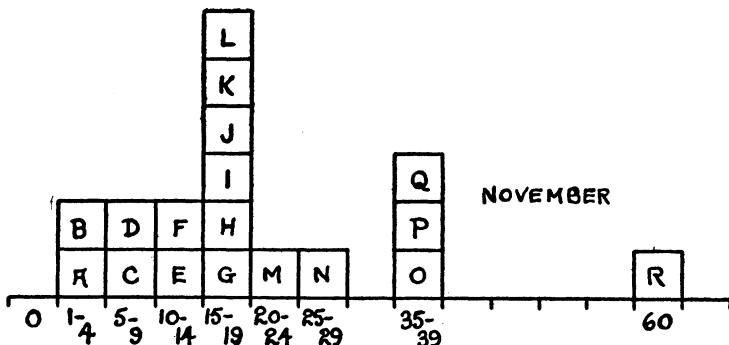


FIG. 1.—Distribution and rank of individuals according to words missed in dictated story, November, 1916. (120 words, Jones II and III Grade vocabulary.)

The four poor spellers are, according to this measurement, R, O, P, and Q, while the best are A, B, C, and D.

Using this ranking as a basis of comparison, we can follow the pupils through other measurements as shown in Table I.

TABLE I

Highest		Lowest
R.....	Hicks daily lessons.	I J H N S
K.....	Hicks review test with study.	J Q H N S
(Tie) A B K.....	Hicks recall after one week, no restudy.	R P O L N
A B.....	Jones II and III Grade vocabulary, in story, no study.	N O P Q R
A B.....	Jones II and III Grade vocabulary, in lists, no study.	N O P Q R
A B.....	Ayres tests, November.	N O P Q R
A B.....	Spelling in original compositions.	N O P Q R
B A.....	Test of power with hard words.	N O P Q R

The case of pupil R is especially significant. He was the highest in rank in the lessons in which school study and unlimited home study were allowed. Under every other condition, he made exceedingly low scores. His study did him no permanent good. It simply prepared him for the day's lesson. His spelling conscience had not functioned except on spelling slips.

Pupils A and B, who did not lead the class in studied spelling lessons from the Hicks speller, had sufficient ability in every other type of spelling to rank first and second.

Pupils N, O, P, Q, and R certainly seemed to have definite spelling needs not covered by the Hicks list or method. They will perhaps never be "champion" spellers, and, judging by the standards of everyday life, they must study the simple words of the second- and third-grade child's vocabulary, so that they can do better than to misspell at least one word of every three which they write.

A list of words missed by each individual on the weekly dictation lessons of one month was kept, and from this list a

class list was made. Generalizations could be made from this class list. This is the usual procedure; but, on close study of the individual lists, nothing short of individual instruction promises to solve the spelling problem. One might have said that the greatest failing of the class as a whole was on arbitrary spellings which cannot be reduced to rules. But there were certain poor spellers who did not exhibit this fault in a marked degree, while they did have peculiar conceptions of certain groups of words. One pupil confused *gh* with *ght* in almost every case. Another doubled letters where he should not have done so, and did not double them when he should have. Another missed words of more than two syllables, usually amputating parts of each syllable but leaving both ends of the word intact. Another simply sounded words out and spelled them phonetically. Still another jumbled letters or transposed them, while others had trouble with homonyms or with final letters. But even these had to be subclassified if they were to be helped economically. A word which is difficult for one pupil may be very easy for another.

Experiments were next made to determine whether the pupils knew their own difficulties. A list of fifty words was presented, and pupils were asked to underscore the five hardest words. They were told to underline parts of other words which they thought difficult. Every word in the list was marked by at least one pupil, and the markings agreed significantly with the teacher's diagnosis of individual difficulties. Pupils were given permission to copy the five words which they thought most difficult, and at intervals during the day they were given an opportunity to look at their lists. During the regular spelling time they studied parts of words which they thought puzzling or difficult, neglecting words which they thought they knew. The next day each pupil was given a chance to try himself out to see which words he still needed to learn. Pupils marked their own words, and

no record was kept of the standings, but the same list was given a week later for a record. Pupils knew that the words would be required at some future date, but were not told how or when, nor reminded of the fact. When the list was given, there were twelve who had perfect records, and the poorest paper had only twelve words of the fifty wrong. The class average was 94, and interest ran high. Several of the pupils had taken their lists home and reviewed difficult words every night. They seemed to know their difficulties and to know when they had mastered words.

This was the end of the preliminary investigation. The results were studied carefully, current educational publications and books were consulted for further light on the subject, and, on the basis of the following conclusions, a group of methods was formulated and put into practice.

Procedures found wasteful in the preliminary survey were:

1. Assignment of words for which the child has no definite spelling need.
2. Requiring every pupil to study every word in the lesson, with equal stress on all words.
3. Mechanical rewriting of words from a visible copy, a given number of times.
4. Home study.
5. Exclusive use of words in lists, as a measurement of spelling ability.
6. Insufficient drill to fix or correct a habit, i.e., under-learning.
7. Deferred correction of mistakes.
8. Overemphasis of oral spelling and oral preparation.

#### CONCLUSIONS WHICH FORMED THE BASIS FOR NEW METHOD

1. The principle on which most word-lists are selected is wrong. The lists are too long and are based on the reading or speaking vocabulary of the schoolroom, or on some still more

irrelevant source. To correct this fault, word-lists should be compiled as follows:

*a)* A short minimal list for each grade should contain only words which through concrete investigation have been found essential for the written English of the grade. The minimal lists should be compiled from the Jones Graded List, the Ayres Spelling Scale, and a local list based on the actual spelling needs as revealed in written work.

*b)* A supplementary list for each grade should contain words of especial use in the grade, words often requested in connection with written composition, or words which assume significance in connection with local or current issues.

*c)* The net result of a year's work in spelling should be an automatic reproducible reaction to all words of the minimal list as they occur in lists or in any written work.

*d)* The requirements for the supplementary lists should not be rigid. Pupils could be supplied with supplemental lists and be held responsible for looking up words which occur in written exercises, or be held responsible for daily work, but not for automatic recall without review except on words of the minimal list.

2. The principles on which many spelling methods are based are the cause of much poor spelling. Any spelling method which does not meet the following requirements does not qualify for wide use:

*a)* The method must reach the individual poor spellers and raise the quality of their spelling markedly by every test.

*b)* The method must be practical and economical of time and labor. During the period in which the efficacy of any method is being tested, no home study or other unmeasurable factor must be allowed to interfere with the results.

*c)* The method must take into account the necessity for later recall of words without definite review or relearning. It must produce a permanent, functioning spelling vocabulary.

*d)* The method must appeal to the responsibility of the pupil, enlist his best efforts, and develop his spelling conscience.

So few teachers would be sufficiently interested in the technique of constructing a method which fulfilled the requirements outlined that no detailed account will be given here. The methods were devised synthetically from the materials made available in the preliminary survey, and the results of eighteen weeks of use are graphically represented. Since the expiration of the eighteen weeks of careful testing, similar scores were sought which had been obtained by the use of other methods, but without avail. If the method outlined seems didactic and formal, it is because the writer wishes to be sufficiently precise in description to permit the reader to duplicate the experiment and test the validity of the findings.

#### METHODS

As the procedure varies from day to day, the successive steps are given for days.

*Tuesday.*—Twenty-five words selected from the Jones II, III, and IV Grade lists are placed on the blackboard beforehand. The teacher pronounces each word and asks the pupils to rise if they have questions or do not understand a word's meaning. The teacher illustrates or defines the word orally if the need arises, and syllabication is given. Each pupil then selects the word which he considers the hardest in the lesson, and writes it on a study-paper which is prepared as in Fig. 2.

The hardest word is put in place numbered 1 on the front of the slip. Pupils then select individually four other words considered difficult, writing them in places numbered 2, 3, 4, 5. Each compares his words carefully with the blackboard list to see that the words are copied correctly, and then proceeds to memorize the list of five words, visualizing carefully. At a signal the study-slips are turned over and the five words are put into places 1, 2, 3, 4, 5 from memory. After two minutes, or less if may be, pupils exchange papers by pairs and mark

Front		Oct. 18, 1918	Reverse	
Fred Smith			Memory Work	
1.enough	(Missed)	11.iron	1.enough	(Corrections)
2.remember	1.remember	12.pieces	2.remember	12.pieces x
3.juicy	2.juicy	13.alone	3.juicy	13.alone
4.quarrel	3.nickel	14.beauty	4.quarrel	14.beauty
5.nickel	4.pieces	15.carried	5._____	15.carried
6.theirs	5.learn	16.knowing	6.theirs	16.knowing
7.school	6.don't	17.learn	7.school	17.learning
8.used	7.yesterday	18.don't	8.which	18.dont ('')
9.which		19.friend	9.often	19.friend
10.often		20.yesterday	10.used	20._____
nickel		nickel	nickel	

FIG. 2.—Reproduction of study-slip.

1, 2, 3, 4, 5 are words selected from a list of twenty-five by Fred Smith, as the most difficult, and copied into these places on the front of the slip from the blackboard.

In the same corner of the reverse side of the slip, these same words appear written from memory.

Mistakes are corrected in the middle column of the front.

6, 7, 8, 9, 10 are words selected by Fred Smith as next in difficulty. After study these words are written from memory on the reverse side of the slip, etc.

After twenty words have been copied thus in groups of five, studied, memorized, and written on the reverse s'de, words in the center column are restudied and written from memory in the center column of the reverse side of slip. The sides of the slip are folded back so that no words appear to help the writer.

one another's words. Papers are returned and words omitted or missed are placed in the middle column.

The next two minutes are spent in selecting and studying words 6, 7, 8, 9, and 10.

The pupils continue in this way until twenty words have been selected for study, repeating every part of the procedure used with the five most difficult words, but taking less time with the easier words. Pupils who have completed the study of twenty words with no mistakes or omissions rise and assist the teacher in her work with those who have missed, by hearing those spell who have less than five mistakes. The teacher works intensively and individually with the poorest spellers, noting the type of failures on the study-slips and supervising additional drill or writing of words missed. It will be noted that the five words which each pupil considers easiest are not studied. They have been noticed by pupils while the others were being selected, and need no further attention. After the children know what is expected of them, this study-method can be followed in less than twenty-five minutes. Twenty-five minutes was the time limit in this experiment.

*Wednesday.*—The words studied on Tuesday are given as a list lesson. Papers are exchanged, marked by pupils, and returned. Pens are put away to eliminate the temptation to get credit by altering spellings, and words missed are written correctly in pencil on the back of the corrected slip and in a notebook. Those who have perfect papers file them with the teacher and hear the restudied words of pupils who missed less than five of the twenty-five pronounced words. The teacher helps those who missed more than five and collects the papers of those who missed less than five to make sure they are correctly marked and restudied. Some record of the result is posted, either the class median or the class average or the number of pupils who missed less than three words. As the teacher looks over the papers, there is no need of fussing about pupils' markings. The purpose of allowing the pupils to do the preliminary marking is evident: it develops critical ability and conditions immediate relearning.

*Thursday.*—This lesson is a study-lesson similar to the one outlined for Tuesday. The words are studied in the same way or as follows: The teacher omits the preliminary pronunciation of the twenty-five words in the list. Instead she points to any word at random, asking the class to pronounce it. She then covers the word and spells it aloud by syllables while each pupil puts it into one of the four places on the study-slip according to his judgment of its difficulty. This is repeated until the teacher has selected and the pupils have placed ten words. They are then told to choose ten more words to fill in the vacant places on their study-slips, omitting the five easiest ones and being careful to copy correctly and place words according to difficulty. In order to place them thus, the pupil must scan the whole list carefully. When this has been done, each pupil proceeds to memorize the first group of five words. After this he exchanges slips with his neighbor, and the two spell the words orally to each other in turn. Those who make no mis-

takes or omissions study the next group of five words in the same way. At the end of the period those who have no mistakes have one side of the study-slip blank. They then turn to this side and write as many words as they can from memory. This memory work is a device to secure intense effort and to eliminate unthinking repetition with lagging attention. It produces a degree of over-learning that makes for better retention and more vivid impressions. Pupils are not required to write the words from memory the next day, but the practice of remembering for short intervals influences the retention over longer periods of time. Pupils who fail in the oral study-method may finish the study by the method outlined for Tuesday. The oral method is a little harder to control. Pupils or classes who take advantage of the freedom given, and become noisy, need not be given the privilege of oral study. Even though partners choose the same word, no harm is done, as this is a study-lesson and the coincidence may serve to impress the word.

*Friday.*—The words studied on Thursday are pronounced. Wednesday's procedure is followed in marking and correcting words.

*Monday.*—The children are told that they must now expect to meet spelling words of the preceding week in all sorts of unexpected places; that they must always spell them as they saw them spelled on the blackboard list and make an effort to hold what they have learned. A short dictation lesson is given including many words of the past week's lessons. The children are encouraged to notice familiar words. They are then told that they will meet these words again and again, and must always be ready to meet the challenge by spelling them correctly. They are told that only those words are put into spelling lists which must be used over and over all through life. Therefore, all must be ready for recall at any moment, and *no word is learned until it is ready for use without review.*

*Tuesday*.—Procedure of the preceding Tuesday is followed with twenty-five words selected from the same sources.

*Wednesday, Thursday, and Friday*.—Same as in the previous week.

*Monday*.—A review lesson is given containing the fifty words which were in the lessons during the *first week* of the method. These words have not been restudied for ten days and have not been mentioned during the spelling lesson for a week. No opportunity for preparation is given. The pupils are told that this is the first real test of whether those words were learned. Half of them are to appear in short sentences, the rest in lists. Words are marked when the papers are exchanged, and those missed are posted by the pupils in their notebooks. If they have been previously missed, this fact is noted. Papers are collected and looked over by the teacher. Pupils' standings in this recall lesson are compared with the standings in the lessons in which the words were first given. Pupils who do not retain what they learn are spoken to concerning their deficiency. The class record is posted, and pupils are shown how to keep a similar record of their own standings. They are informed that 100 per week is a perfect score on Wednesday's and Friday's words. Recall lessons are scored separately and count as tests. As there are fifty words, each word counts 2 on the score. If an *i* is not dotted or a *t* is not crossed, or if a word has been changed, it counts only 1. The omission of the apostrophe or a mistake in capitalization subtracts two from the score.

These are the methods used. All the suggested procedures are based on practically the same principles, except that in one case the appeal is made to play enthusiasm, while in the other those who study well are given privilege work or made helpers. The oral recall is followed by written recall on Thursdays as suggested, so that the possible effect of a too playful attitude is corrected while the benefit of the play method is retained.

After the method has become thoroughly habitual, the results of the Monday recall lessons are studied carefully by the teacher.

Valuable aids in the diagnosis of spelling difficulties are discovered in this study. Those who stand high on recall lessons and low on original lessons profit greatly by their own mistakes if these are pointed out and opportunity for immediate relearning is given.

A low original score with a similarly low recall standing indicates a more serious difficulty. It is probably the failure to study intensely. The pupil will perhaps say he needs more time and perhaps be willing to study at home. He will derive greater benefit, however, if he is taught to study more intensely under school conditions, stressing difficulties, underlining hard places, and keeping his attention at a high level. Home study usually results in great waste of time over a few words, or in the mechanical copying of all words a certain number of times, with no active thought. This method often secures improved spelling lessons, but seldom builds up ability in poor spellers, because it puts the preparation of lessons beyond the control of the teacher, and makes it hard for her to improve the study-habits and remove the spelling troubles of her pupils.

Pupils who stand high on original lessons and low on recall need practice in retaining what they learn. Often they are pupils who learn very readily and forget with equal ease. Sometimes they are merely victims of the old order, who think they have fulfilled all obligations when they have stood well on the immediate spelling test. Their spelling in other written work is likely to be original rather than correct. The true function of the spelling lesson must be made clear to these pupils, and they must be given frequent opportunities to test their retentive powers. They must keep individual records in order to bring home to themselves the loss which comes from missing words in recall lessons. They may be required

to write sentences containing all the words which they miss in recall lessons after other children are dismissed, if no other method serves to impress the importance of a functioning ability in spelling.

Pupils' notebooks, containing a record of all the words missed, may be the basis of individual corrective drill at regular intervals. To avoid impairing the validity of the experiment this was not done during this study.

#### THE RESULTS OF THE EXPERIMENT

The results of the experimental use of the methods outlined above are shown in class graphs for eighteen weeks in Fig. 3. Averages are used. The class median was usually higher. The drop recorded in the sixteenth week is due to the fact that the study-time of the better spellers was diminished and supplementary lessons in dictionary use assigned for part of the study-period. The drop was not permanent.

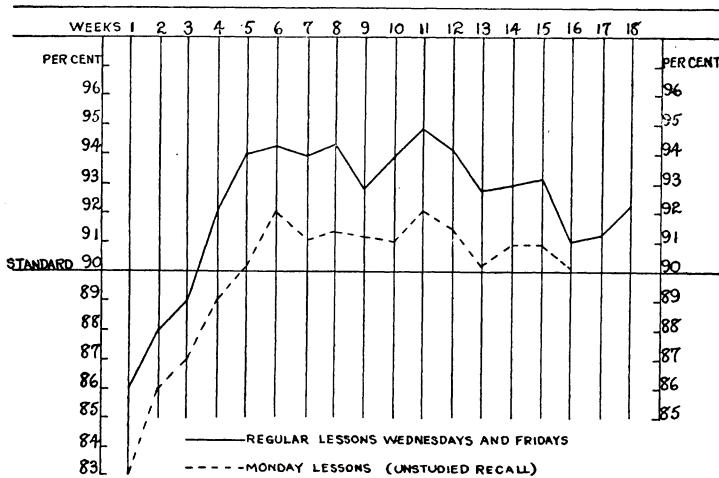


FIG. 3.—Graphic record of class average in regular lessons and unstudied recall for eighteen weeks of instruction according to experimental method outlined.

The heavy line is the class score by weeks on lessons given Wednesdays and Fridays. The dotted line is the score on the same words given in the second succeeding week. The verticals

show the percentage of accuracy. Ninety per cent was set as a standard, below which work was considered unsatisfactory. Thus the class average for the first week was 86 on regular lists and 83 on recall. The highest point was reached in the eleventh week. The regular lesson average was 94.6, and the recall standing 92. The lowest score was made the first week, and after the method was introduced and established the score in both the regular and the recall lessons remained above the standard set. In no case did the class average on a recall lesson fall more than 3.7 per cent below the standing obtained on the first trial.

The recall ability and the other spelling abilities which were developed by this method, may be compared with results of other methods and with results which were obtained by the study of poorly selected word-lists. The net gain in spelling ability may be shown by a comparison of the distribution in Fig. 1 with that in Fig. 4. Dictation lessons are functional tests of spelling ability, and these distributions are therefore significant.

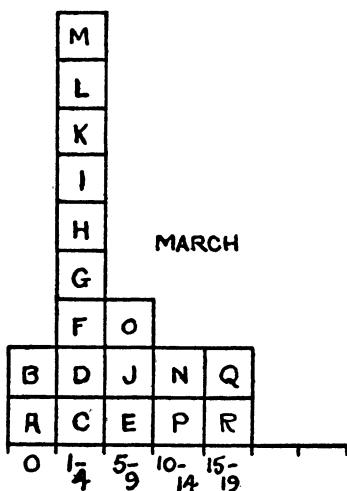


FIG. 4.—Distribution and rank of individuals according to words missed in dictated story, March, 1917, after twelve weeks of instruction by new method. (120 words, Jones II and III Grade vocabulary)

In a set of original compositions written in November, before the new method and new lists were used, 164 words were missed. In February a set was marked, and there were thirty-five misspelled words found. In March a set of compositions was marked for spelling, and there were thirty-three words missed.

Dictation lessons during language time were given weekly to correlate spelling in lists with language work. Some such device promotes the transfer of training from formal spelling instruction to composition and is therefore very important.

There is one class of words which cannot be learned by study in lists. Homonyms are the words referred to. They can be studied profitably if they are given in connection with another word which determines the meaning. These groupings were used and were later incorporated into dictation exercises:

one cent	see and hear	theirs and ours
a weak place	ate too much	some trouble
lost or won	here and there	two hours
right or left	a whole year	to and fro
right or wrong	yours and theirs	back and forth

New words not in the pupils' writing vocabularies were introduced in the language lessons and often incorporated into succeeding dictations. Syllabication was shown to be helpful in the study of new words in reading and language, as well as in spelling. Rules for dividing words at the end of a line were studied in this connection.

The results of November and March tests are compared in Fig. 5 as a final means of evaluating the methods used.

The Ayres words were not studied except as they happened to appear in the Jones lists. This was done so that the Ayres tests might be used at the end of the experiment. The class record in the Ayres tests given in November and March are therefore comparable.

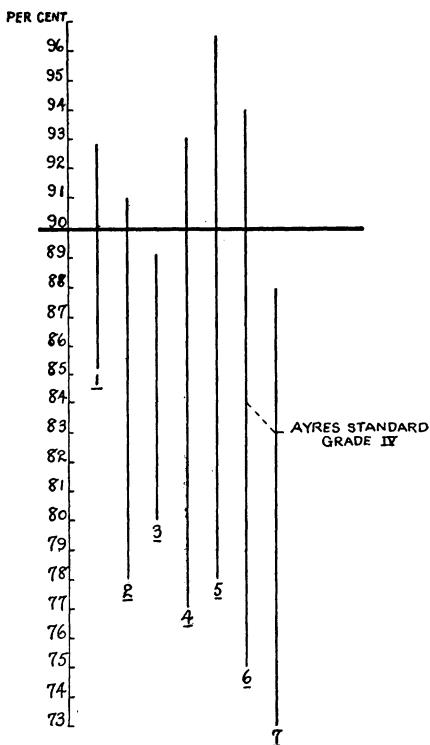


FIG. 5.—Measures of improvement based on November and March tests. 1, Regular lesson; 2, recall; 3, review of most difficult words:—Hicks review with study; Jones 100 demons without study; 4, dictated story; 5, original composition; 6, Ayres Test M; 7, Ayres Tests E-S, 5 from each.

Sample lists of twenty-five words are given. They are selected from the Jones II, III, or IV Grade vocabulary or the Jones list of 100 spelling demons. They are lists used during the first, third, tenth, eleventh, and twelfth weeks of the experiment.

alone	along	center	true	promised
beauty	excuse	does	almost	sloping
carried	children	earlier	flowers	distance
don't	believe	field	separate	rough
enough	dream	heavy	window	cousin
friend	further	girls	afraid	fixed
girl	heard	Indians	fellow	cough

half	guess	just	climb	coaxed
iron	just	knees	money	different
juicy	inches	learning	pages	wrecked
knowing	kind	minutes	sleigh	sight
learn	lesson	owner	icicle	nature
many	mountain	quart	also	busy
nickel	neither	toward	eraser	unless
often	o'clock	used	pictures	useful
pieces	people	walking	whether	known
quarrel	quiet	talked	certain	depot
remember	something	think	couldn't	desk
school	reach	half	against	wrote
theirs	unless	thought	laughing	none
used	visit	doesn't	knocking	ago
very	they	finish	study	peace
which	walk	third	pencil	war
yesterday	yours	hurry	scratch	harbor
any	women	beginning	stories	surely

The ability of the class in March was distinctly superior to the fourth-grade scores obtained in the Cleveland Survey. The Cleveland Grade IV average was 73; the University School Grade IV average was 94.4. The class ranked as high as the Ayres fifth-grade expectation or higher. The November test on the Ayres words showed the class rank to be similar to that expected of a medium third grade. Exact figures are given for comparison in judging the efficacy of the method used. The results were sufficiently permanent to produce high scores during the ensuing year.

TABLE II  
AYRES TESTS: TABLE OF RESULTS

	List														
	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Ayres III Grade expectation	98	96	94	92.0	88.0	84	79.0	73	66	58	50.0	.....	.....	.....	.....
University School IV Grade															
November average.....	96	92	93	94.0	87.5	87	77.5	80	75	55	43.0	52.0	44	.....	...
Ayres IV Grade expectation	100	100	99	98.0	96.0	94	92.0	88	84	80	73.0	66.0	58	50.0	...
University School IV Grade															
March average.....	100	100	99	97.5	96.5	96	95.5	93	94	89	84.5	88.5	80	76.5	70.47
Ayres V Grade expectation	100	100	100	100.0	99.0	98	96.0	94	92	88	84.0	79.0	73	66.0	58.50

The experiment was continued with a new class. The lesson was cut to twenty minutes a day and the time saved given over to language. Fifteen minutes a week during the time allotted to language was then given to the study of word-groups which were similar or related. Formal rules for spelling were not learned, but inferences concerning uniformities in the spelling of certain classes of words were drawn when sufficient evidence warranted them. False analogies were shown to be unreliable. The remainder of the language lesson was used for the weekly dictation. The sentence-completion method as part of the correlated language work was found especially helpful in fixing troublesome homonyms.

Slight changes in the administration of the method were made. Some, however, were not improvements. For instance, reducing the number of words and giving five written test lessons instead of two a week was not found advisable. The slight strain of holding a larger number of words in mind seemed to tap higher levels of attention.

The following variations in method stood the test of use. Duplicated or printed sheets were used for some of the lessons instead of blackboard lists. Sentences containing words to be learned were used, the pupils memorizing two sentences at a time. The sentences were written from memory the next day after one preliminary reading by the teacher. There were usually five or six sentences in a lesson, the exact number depending on the possibility of grouping the twenty-five words into sentences. Words which did not become class property were given a conspicuous place on the blackboard for a week, under this legend: "Never again."

Possibly the work of other grades is such that some change in method might be needed to meet their requirements. Perhaps in the upper grades one lesson per week will suffice with the method outlined, for the minimum lists. Perhaps more supplementary work could be given in the upper grades if

minimum spelling essentials were made the definite concern of grades below the sixth. Perhaps fifty words are more than a third grade should study in one week, even though the words are taken from the children's vocabularies of Grades II and III instead of from arbitrary lists. Perhaps third-grade children need more than the suggested number of writings to fix a word. When each writing is a careful, thoughtful spelling from memory, it no doubt strengthens the habit much more than the customary practice of writing words three or five or any prescribed number of times, each repetition being a mere copy of the characters above it. Only by experiment can we discover whether or not these suppositions are correct. Experimentation reveals the basic manner in which any method must be tested.

The spelling method for the fourth grade as finally adopted was developed experimentally, and evaluated by a comparison of its results with the standard scores obtained by reputable investigators. There is no reason why the procedure for other grades as well as methods in other subjects cannot be similarly developed and tested. This is one of the practical functions of educational measurement in the hands of the teachers.

#### GENERAL CONCLUSIONS

The data obtained from this experiment, and similar studies in the development of methods in reading and arithmetic, point to the possibility of doubling the efficiency of instruction without making radical changes in school organization:

1. By defining the ends of instruction and devising means which stand the pragmatic test.
2. By rousing the child's sense of responsibility, setting up definite standards of achievement based on a study of educational measurement, and covering more than the formal phases of the work.
3. By developing the latent ability in pupils through adequate motivation and a constant appeal to the higher levels of attention.

4. By so controlling drill that the dull monotony of repetition on the lower levels of attention does not defeat the very purpose of drill and result in deterioration of habits to be formed.
5. By basing procedure with individuals on a careful diagnosis of the needs of each pupil, and adapting the instruction to the individual's own conscious needs.
6. By intensive work on minimum essentials with poor pupils, and immediate corrective practice or training.
7. By providing suitable supplementary work for pupils who have surpassed standards.
8. By economy, reducing the time needed for formal instruction through efficiency of method and frequent measurement of results.
9. By providing for sufficient overlearning to insure permanence of minima as the net result of a year's work.
10. By eliminating immediate preparation for tests or review lessons, thus testing habit formation and diagnosing difficulties to be mastered in review.
11. If the methods of teaching minima were standardized, those subjects which contribute largely to the social and spiritual values of education could be given the prominence which they deserve. Schoolroom activities of vital significance to the community and nation at large could take up the time now devoted to poorly motivated, uneconomical mass methods in drill lessons. If diagnosis determines the needs of the pupils, and drill methods are scientifically tested and applied, the number of failures in formal subjects can be greatly reduced. There are great possibilities in extensive teaching and supplementary activities for pupils who have surpassed minima, and it is quite possible that these outweigh the value or advisability of varying rates of promotion.

Only careful experimentation can throw light on these problems, and the schoolroom is the laboratory in which the solutions may be worked out.